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Atmospheric Measurement Techniques Discussions

Interactive comment on "The First Evaluation of Formaldehyde Column Observations by Pandora Spectrometers during the KORUS-AQ Field Study" *by* Elena Spinei et al.

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We thank the reviewer for his/her thoughtful and constructive comments/recommendations.

1) Page 3, line 25 – consider adding this paper to references: Bryan N. Duncan, Yasuko Yoshida, Jennifer R. Olson, Sanford Sillman, Randall V. Martinf, Lok Lamsal, Yongtao Hug, Kenneth E. Pickering, Christian Retscher, Dale J. Allen h, James H. Crawford (2010), Application of OMI observations to a space-based indicator of NOx and VOC controls on surface ozone formation, Atmospheric Environment, 44, 2213-2223, doi:10.1016/j.atmosenv.2010.03.010.

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- Added

2) Page 4, line 6 – consider adding this paper to references: Olga Pikelnaya, Stephen C. Hurlock, Sebastian Trick, and Jochen Stutz (2007), Intercomparison of Multi-Axis and Long-Path DOAS Mea- surements in the Marine Boundary Layer, J. Geophys. Res., VOL. 112, D10S01, doi:10.1029/2006JD007727.

- Added

3) Page 6, line 7 – add reference for DOAS technique, e.g. Platt and Stutz (2008), Differential Optical Absorption Spectroscopy Principles and Applications, Springer, ISBN 978-3-540-75776-4.

- Added

4) Section 2.1.1 - Add an example of HCHO spectral retrieval.

- The following sentences and Fig. 2 panels were added: "Figure 2(b) shows an example of common optical depth residuals calculated by the DOAS fitting algorithm of 4537 cloud/spatial stray light free DS measurements and scaled by DS AMF. Figure 2(c) illustrates the effect of this residual spectrum on the retrieval of 0.5 DU (background levels) of HCHO. "

Figure 2. (a) Estimation of total HCHO column errors from Pandora direct sun measurements during KORUS-AQ (May-June 2016) at Mt. Taehwa; (b) common DOAS fitting optical depth residuals normalized by direct sun AMF (4537 measurements); (c) optical depth of 0.5 DU HCHO (convolved with Pandora instrument transfer function).

5) Page 6, line 25 – Explain the rationale for selecting 4.3 km for heff.

The following was added: ".. heff is the effective, profile concentration weighted height of a background HCHO distribution over ocean (4.3 km, Millet et al., 2006). heff has a very small effect on accuracy of AMFDS at SZA < 80° evaluated in this study (see discussion of "Uncertainty in the DS AMF" below)."

6) Page 11, line 8 – Define VMR, volume mixing ratio (VMR), and use consistently uppercase or lowercase for VMR throughout the paper.

- VMR replaced with “volume mixing ratio (vmr). Lower case (vmr) is used throughout the paper

7) Figure 4 – Identify both sites on panels (a) and (c) and add a horizontal scale.

- We made some changes to Fig. 4 and its caption to address this recommendation. Figure 4. Summary of all DC-8 flights over the Olympic Park and Mt. Taehwa respectively: (a) and (d) DC-8 GPS altitude above sea level; (b) and (e) HCHO mixing ratios measured onboard DC-8 as a function of latitude and longitude; (c) and (e) HCHO mixing ratios measured onboard DC-8 as a function of altitude and local time. Distance between Mt. Taehwa and Olympic Park sites is approximately 29 km.

8) Page 17, lines 13-14 – Can you comment if flight measurements are in support of your assumption that the most of HCHO column was located in the mixed-layer?

- We added: “Diurnal changes in Ceilometer measured MLH have the same trend as the diurnal changes in the vertical distribution of HCHO measured from the aircraft (see Fig. 4(c, f) and Sec. 2.3) confirming our assumption. “

9) Page 22, line 1 – Add reference to Figure 9.

- Added

10) Page 23, line 12 – Define “good” agreement.

- The following was added: “when the agreement is very good (e.g. within 0.15 DU on 5, 10 June 2016 at Mt. Taehwa and 4 May 2016 at Olympic Park).”

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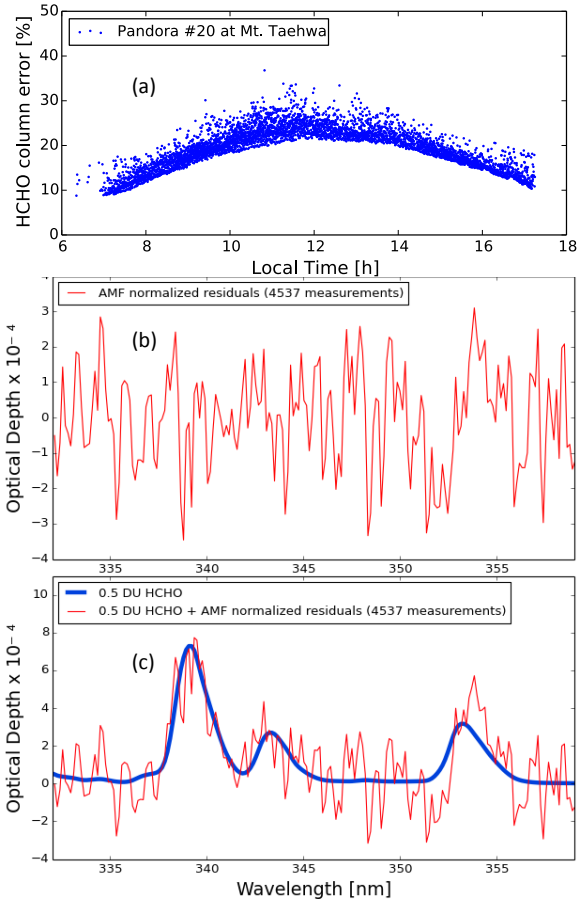

Fig. 1. Figure 2 (see text for caption changes)

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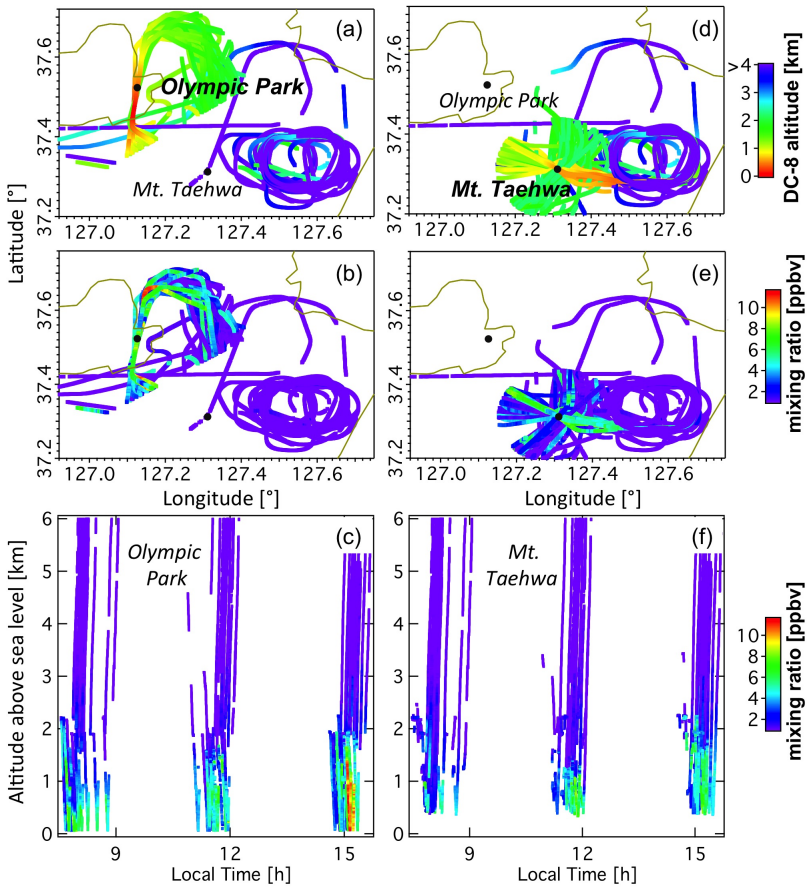

Fig. 2. Figure 4 (see text for caption changes)

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